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ABSTRACT

The document presents unit plans which offer list of experiences and competencies to be learned for general shop occupations in vocational agriculture. The units include: (1) arc welding, (2) oxy-acetylene welding, (3) flat concrete, (4) concrete block, (5) lumber patterns and wood building materials, (6) metal fasteners, (7) wood adhesives, (8) plywood, (9) building framing, (10) rafters and trusses, (11) roofing, (12) painting and glazing, (13) electrical principles, (14) electrical wiring, (15) hand tool identification and tool reconditioning, (16) cold metal, (17) sheet metal, (18) soldering, (19) plumbing, (20) shop safety, and (21) project construction. The number of hours required for each unit are given. (EC)

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General Shop Competencies

in

Vocational Agriculture

For

9th and 10th Grade Classes

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General Course Competencies to Accomplish

1. Develop correct shop attitudes.
2. Learn correct work procedures.
3. Learn correct shop safety procedures.
4. Introduction to the world of work.
5. Learn proper work planning and organization.
6. Identification and proper use of all hand tools.
7. Identification and proper use of power tools.
8. Exploration of shop units.
9. Exploration of student abilities.
10. Develop pride in workmanship.

Unit I - Arc Welding Competencies

1. Set up and run an arc welder.
2. Proper selection of electrodes.
3. Develop basic welding skills.
4. Understanding of jobs related to welding occupations.
5. Understanding the basic properties of metals.
6. Develop safe work habits while arc welding.

Unit I ARC WELDING (25 hours) -- Ability to . . .

LESSON 1. Arc Welding Safety
a. Pass arc welding safety test.
b. Demonstrate safe welding procedure.

LESSON 2. Arc Welder Selection Operation and Safety -- 1 hour
a. Identify the difference between A.C. and D.C. welders.
b. Identify the name plate data for welder selection.
c. List accessories available for arc welders.
d. List safety precautions.

LESSON 3. Electrode Selection and Striking an Arc -- 1 hour
a. Identify the N.E.M.A. color code.
b. Identify the A.W.S. numbering system.
c. Identify the scratching and tapping method to strike an arc.

LESSON 4. Electrode Selection and Stiking an Arc -- 1 hour
a. Continue N.E.M.A. color code.
b. Continue the A.W.S. numbering system.
c. Demonstrate the scratching and tapping method to strike an arc.

LESSON 5. Running a Bead in the Flat Position -- 1 hour
a. Identify amperage setting.
b. Rate of travel.
c. Angle of electrode.
d. Length of arc gape.
e. To observe demonstration of running bead in the flat position.

LESSON 6. Running a Bead in the Flat Position -- 1 hour
a. Run beads with different electrodes.

LESSON 7. Running a Bead in the Flat Position -- 1 hour
a. Run beads with different electrodes.
b. Run beads to make a pad.

LESSON 8. Running a Bead in the Flat Position -- 1 hour
a. Continue running beads in the flat position.

LESSON 9. Running Bead in the Flat Position -- 1 hour
a. Continue running beads in the flat position as well as getting use to amp setting, rate of travel, angle of electrode, and length of arc gap.

LESSON 10. Butt Weld in the Flat Position -- 1 hour
- a. To control distortion.
- b. To space and tack the plates.
- c. To differentiate between regular and drag electrodes.
- d. To hold the correct electrode angles.

LESSON 11. Butt Weld in the Flat Position -- 1 hour
- a. Observe demonstration of butt weld in flat position.
- b. Run beads with regular and drag electrodes.
- c. Run butt weld in flat position.

LESSON 12. Butt Weld in the Flat Position -- 1 hour
- a. Run proper butt weld in flat position.
- b. Determine if one has right amperage, arc length, angle and speed of travel.

LESSON 13. Lap Weld in the Flat Position -- 1 hour
- a. Hold the correct electrode angles.
- b. Stop and start with a new electrode.
- c. Fill the crater at the end of a weld.

LESSON 14. Lap Weld in the Flat Position -- 1 hour
- a. To practice the actual lap weld in the flat position.

LESSON 15. Fillet Weld on a "T" Joint in the Flat Position -- 1 hour
- a. Hold the correct angles and arc length.
- b. List advantages and disadvantages of low hydrogen electrodes.

LESSON 16. Fillet Weld on a "T" Joint in the Flat Position -- 1 hour
- a. Run beads with a low hydrogen electrode.
- b. Run fillet weld on "T" joint in the flat position.

LESSON 17. Fillet Weld on a "T" Joint in the Flat Position -- 1 hour
- a. Continue running fillet beads on the "T" joint in the flat position.

LESSON 18. Pipe Welding -- 1 hour
- a. Layout angles for 45°, 90° and "T" joints with pipe.
- b. Weld pipe by rolling.

LESSON 19. Pipe Welding -- 1 hour
- a. Practice lay out angles for 45°, 90° and "T" joints with pipes.
- b. Weld pipe by not rolling.
- c. Run beads with different electrodes.

LESSON 20. Position Welding -- 1 hour
- a. List different angles, arc lengths, amperages and speed of travel for welding with the E6011.
- b. Weld vertical down.

LESSON 21. Position Welding -- 1 hour
- a. Weld vertical down.
- b. Weld horizontal butt.
- c. Weld overhead.

LESSON 22.-25. Project Construction -- 4 hours.

Unit II - Oxy-acetylene Competencies

1. Safe operation of equipment.
2. Proper set-up and use of equipment.
3. To develop basic gas welding skills.
4. Proper use and selection of gas welding rods.
5. Plan construction procedures for jobs utilizing gas welding.

Unit II - OXY-ACETYLENE WELDING (28 hours) -- Ability to . . .

LESSON 1. Welding Cylinders, Gages, Welding Tips, and Cutting Tip -- 3 hours
- a. List safety involved in handling acetylene and oxygen cylinders.
- b. List the procedure for the operation of gages and regulators.
- c. Demonstrate setting gages for the welding job.
- d. Demonstrate switching cylinders and regulators.
- e. List the different size welding tips and where to use them.
- f. Demonstrate how the cutting tip works.

LESSON 2. Welding Accessories and Safety -- 1 hour
- a. Demonstrate the spark lighter properly.
- b. Hookup oxyacetylene hoses properly and safely.
- c. Identify the need for proper goggles.
- d. Identify the necessities of wearing protective clothing.
- e. List all the safety factors involved in oxyacetylene welding.

LESSON 3. Lighting the Torch, Types of Flames -- 1 hour
- a. List the procedures involved in lighting the torch.
- b. Open and close cylinder valves correctly.
- c. Adjust regulator screw to the required working pressure.
- d. Light the acetylene with the spark lighter.
- e. Adjust oxygen flow to get the desired flames.
- f. List three types of flames and their uses.
- g. Set the flame according to the welding job.
- h. Outline problems involved with using an improper flame.
- i. Shut-off the torch properly.

LESSON 4. Running A Bead Without a Rod -- 3 hours
- a. Hold the torch properly and use the right size tip.
- b. The factors involved (Speed of travel, tip to weld differences,etc.) to get proper penetration.
- c. Run a puddle bead on a flat surface.
- d. Run a flange butt puddle on light weight sheet metal
- e. Identify bead appearance and its characteristics.

LESSON 5. Running a bead in flat position -- 3 hours
- a. Choose the correct filler rod for the job.
- b. Hold the rod and torch properly.
- c. List the factors involved (speed, rod and tip and tip angle, etc.) to get proper penetration.
- d. List bead appearance and its characteristics when using a filler rod.

LESSON 6. Running a Bead in Flat Position -- 3 hours
- a. Run a stringer bead on a flat surface properly.
- b. Run a butt weld properly.
- c. Run a fillet weld properly.

LESSON 7. Fillet and Butt Welds in Position -- 5 hours
- A. Run butt, lap and "T" joints in all positions.

LESSON 8. Brazing -- 2 hours

a. Select correct welding tip for brazing.
b. List reasons why and how the metal is to be cleaned before brazing.
c. List the factors involved to get proper penetration.

LESSON 9. Brazing -- 4 hours

a. Hold brazing rod and torch properly.
b. Run a butt weld properly.
c. Run a lap weld properly.
d. Make silver brazed joints.

LESSON 10. Cutting Metal of Various Thickness and Hole Piercing -- 3 hours

a. List proper procedure of cutting process.
b. Adjust regulators and cutting tip size according to the thickness.
c. List correct cutting procedure.
d. List procedure for light cutting torch.
e. Make a straight cut on metal.
f. Cut out a round hole in the metal.
g. Identify bevel metal.

Unit III - Concrete Work Competencies

1. Recognize the properties of good concrete.
2. Properly mix, place, finish, and cure concrete.

Unit III FLAT CONCRETE (10 hours) -- Ability to . . .

LESSON 1. Selection of aggregates for concrete -- 1 hour
- a. Discuss the importance of aggregates in quality concrete.
- b. Perform silt and organic matter test to determine quality concrete.

LESSON 2. Air entrained concrete -- 1 hour
- a. List the advantages and disadvantages of air entrained concrete.
- b. Determine percentage of air entrainment desired by use of an entraining test.

LESSON 3. Selection and design of concrete mixtures -- 1 hour
- a. List the procedures used when designing a concrete mixture.
- b. Design a concrete mixture.

LESSON 4. Job mixing Concrete -- 1 hour
- a. List the necessary steps for obtaining quality concrete when mixing is done on the job.
- b. Run a slump test.

LESSON 5. Placing concrete -- 2 hours
- a. List concrete placing procedures.
- b. Properly place concrete in a hog trough or drain splash when using a vibrator.

LESSON 6. Finishing concrete slabs -- 1 hour
- a. List the procedures for finishing concrete.
- b. Properly finish the slab with a trowel.
- c.

LESSON 7. Curing concrete -- 1 hour
- a. List the procedures for finishing concrete.
- b. Cure concrete in a freezer, at room temperature (dry) and in a tank of water (wet) and then test at different time intervals (7-14-21-28 days)

LESSON 8. Reinforcement for concrete -- 1 hour
- a. Discuss reasons reinforcement is used and how it is placed in concrete.
- b. Properly reinforce a concrete slab.

LESSON 9. Different designs in concrete -- 1 hour
- a. List the different ways of coloring concrete.
- b. List the different types of finishes used in concrete construction.

Unit IV Concrete Block Competencies

1. Identify the types of blocks.
2. Determine total block needed for a project.
3. Mixing and handling mortar.
4. Laying up a block corner.
5. Laying up a wall.
6. Finish a wall.

Unit IV CONCRETE BLOCK (12 hours) -- Ability to . . .

LESSON 1. Concrete block manufacturing -- 1 hour
- a. List three materials used in making blocks.
- b. Discuss the difference between heavy-weight and light-weight blocks.
- c. Tour a block-manufacturing plant.

LESSON 2. Mortar for concrete block construction -- 1 hour
- a. Recognize the desirable properties of good mortar.
- b. Mix a small batch of mortar.

LESSON 3. Laying concrete block -- 3 hours
- a. Lay block,

LESSON 4. Laying corners -- 4 hours
- a. Construct a corner properly.

LESSON 5. Concrete masonry wall finishes, painting and water painting and water proofing -- 1 hour
- a. Determine the need for water proofing.
- b. Determine the need and procedure of painting blocks.

LESSON 6. Construction details, insulation and ventilation -- 2 hours
- a. Discuss how a properly constructed building is insulated and ventilated to keep it dry.
- b. List different types of insulating materials.
- c. Tour a block building with good ventilation and insulation.

Unit V - Building Materials Competencies

1. Methods of cutting, selection and grading of lumber.
2. Different kinds of nails and hardware.
3. To write a bill of materials
4. Identify correct jobs for different types of material.

Unit V LUMBER PATTERNS & WOOD BUILDING MATERIALS (10 hours) -- Ability to . . .

LESSON 1. Types of materials -- 1 hour
- a. Discuss different types of lumber patterns.
- b. Different types of hard boards.
- c. Determine varieties of wood.

LESSON 2. Grades of lumber and figuring board feet -- 2 hours
- a. Discuss the difference in grades of lumber and hardboards.
- b. Figure board foot and square foot.
- c. Figure linear feet.

LESSON 3. Types of nails and hardware -- 2 hour
- a. Discuss the different types of nails, screw bolts, hinges, tacks, etc.
- b. Distinguish between different nails, screws, etc.
- c. Order hardware items properly.
- d. Show examples of all the different types of hardware available.

LESSON 4. List of materials -- 1 hour
- a. Calculate requirement for a job.
- b. Estimate type and amount of materials.

LESSON 5. Types of hard and soft wood lumber -- 1 hour
- a. List types of hardwood
- b. List types of soft wood
- c. List advantages and disadvantages of each.

LESSON 6. Grains of Wood -- 1 hour
- a. List different types of grain.
- b. List reasons for each type of grain.
- c. Sketch flat or tangential grain and the edge grain.

LESSON 7. Sawing of logs -- 1 hour
- a. Explain slash cut.
- b. Explain quarter sawed.

LESSON 8. Manufacturers' specification system of classification of lumber and grading system -- 1 hour
- a. List criteria for classification of lumber.
- b. List qualification for each grade.

Unit VI - Metal Fastener Competencies

1. Selection and Use of Proper Metal Fasteners.

Unit VI METAL FASTENERS (2 hours) -- Ability to . . .

LESSON 1. Bolts and metal screws -- 1 hour
- a. Recognize the types of bolts and screws.
- b. Recognize the types of nuts.
- c. List types of threads.
- d. Determine how to order bolts and nuts.

LESSON 2. Riveting -- 1 hour
- a. Recognize the different types of rivets.
- b. Use the pop riveter.
- c. List hand riveting tools.
- d. Use the hand riveting tools.
- e. Determine how to order rivets for specific jobs.

Unit VII - Wood Adhesives Competencies

1. How to select wood adhesives.
2. How to identify the different wood adhesives.
3. How to mix, apply and finish joints using wood adhesives.

Unit VII WOOD ADHESIVES (2 hours) -- Ability to . . .

LESSON 1. Principles of wood adhesives -- 1 hour
- a. List principle behind wood adhesives.
- b. List uses of wood adhesives.

LESSON 2. Use of wood adhesives -- 1 hour
- a. List strength of wood adhesives.
- b. Mix wood adhesives.
- c. Proper use and amount of wood adhesives.

Unit VIII - Plywood Competencies

1. The grading, manufacture and selection of plywood.
2. The properties and uses of plywood.
3. Using plywood in construction applications.

Unit VIII PLYWOOD (5 hours) -- Ability to . . .

LESSON 1. Plywood selection -- 2 hours
- a. List the different classifications.
- b. List the different grades.
- c. List factors to consider in selection.

Unit VIII - continued

LESSON 2. Properties of plywood -- 1 hour
- a. List the characteristics of plywood.
- b. List the possible adhesives used in making plywood.

LESSON 3. Processing of plywood -- 1 hour
- a. List means of manufacturing plywood.
- b. Grades of lumber used for plywood.
- c. Different types of wood used.
- d. Uniformity and quality of product.

LESSON 4. Plywood sizes and finishes -- 1 hour
- a. List possible sizes of plywood economically produced.
- b. List the finishes normally found and their application.
- c. Determine size of plywood to use for specific loads.

Unit IX - Building Framing Competencies

1. The use of the framing square.
2. Identify building parts for different construction styles.
3. Construction of the different building components.

Unit IX BUILDING FRAMING (8 hours) -- Ability to . . .

LESSON 1. Using the framing square -- 1 hour
- a. The principle of a framing square as related to the right angle.

LESSON 2. Brace layout -- 2 hours
- a. Read the framing square table for a brace having equal rise and run.
- b. Discuss the fact that a brace with equal rise and run is a right triangle with the opposite 2 angles both being 45^{o}.
- c. Use the square to make the seat and plumb cut.

LESSON 3. Building roof nomenclature -- 2 hours
- a. Discuss the terms span, run, rise, pitch, per foot or run, per given run, ridge board, plage and tail.
- b. Use the measuring line.

LESSON 4. The essential features of framing a pole shed -- 2 hours
- a. Select pole style and size.
- b. List methods of attaching rafters to pole.
- c. Sketch bracing techniques.

LESSON 5. Advantages and disadvantages of pole buildings -- 1 hour
- a. List the advantages and disadvantages of a pole building.
- b. Discuss economic advantages of pole buildings.

Unit X - Rafter and Truss Compentencies

1. To lay out and assemble a rafter
2. Understand different rafter layouts
3. Knowledge of materials used in rafter construction
4. Understand different roof types
5. Orientation of occupations related to carpentry
6. Truss layout and application

Unit X RAFTERS AND TRUSSES (10 hours) -- Ability to . . .

LESSON 1. Common Rafter Layout -- 1 hour
- a. The uses of a common rafter.
- b. Determine the length of rafter.
- c. Measure out the length of rafter.
- d. Make plumb and seat cuts.

LESSON 2. Use of the ridge board -- 1 hour
- a. Discuss when and why a ridge board is used.
- b. Measure length of rafter when a ridge board is used.

LESSON 3. Hip and valley rafter layout -- 1 hour
- a. List the uses of hip and valley rafters.
- b. Determine length of hip and valley rafters.
- c. Shorten rafter for ridge board and lengthen for side cut.

LESSON 4. Jack rafter -- 1 hour
- a. Discuss where Jack rafters are used.
- b. List the three types of Jack rafters.
- c. Measure Jack rafters.

LESSON 5. Roof types -- 1 hour
- a. Describe the different types of roofs.
- b. Discuss when different roof types would be used.
- c. Find run, rise and pitch of the different roof types.

LESSON 6. Truss design and principles -- 1 hour
- a. List the different types of trusses.
- b. Draw the different types.
- c. List different places trusses are.

LESSON 7. Materials and stress selection -- 1 hour
- a. List of possible materials.
- b. List of connection materials.
- c. Discuss length coefficients.

LESSON 8-9 Construction and layout -- 2 hours
- a. Layout a model truss rafter.
- b. Make proper joints to use.
- c. Put models together, see if all are the same.
- d. Build a jig to use.

LESSON 10 Resource person - construction person -- 1 hour
- a. Observe slides on his company's construction jobs.

Unit XI - Roofing Competencies

1. Roofing nomenclature.
2. Different roofing materials and their best application.
3. The proper installation methods of roof materials.

Unit XI ROOFING (3 hours) -- Ability to . . .

LESSON 1. Types of base and covering material -- 1 hour
- a. Recognize when you use asphalt shingles, asbestos shingles, galvanized metal, aluminum or tile.
- b. List different types and styles of each roofing material.
- c. List materials which can be used for walls.

LESSON 2. Application of materials and types of nails -- 1 hour
- a. Recognize proper techniques for applying roofing and siding.
- b. Distinguish roofing nails from lead heads and lengths to use.
- c. Apply roofing and siding.

LESSON 3. Building roof nomenclature -- 1 hour
- a. Define the terms span, run, rise, pitch, per foot of run, per given run, ridge board, plate and tail.
- b. Use the measuring line.
- c. Repair and up keep of roofs.

Unit XII - Painting and Glazing Competencies

1. To measure and cut glass
2. To select paint and prepare a surface for painting.
3. To properly clean a paint brush.
4. The proper procedure for safe storage of paint and brushes.

Unit XII PAINTING AND GLAZING (4 hours) -- Ability to . . .

LESSON 1. Kinds of paints, selection, mixing and use of brushes -- 1 hour
- a. Discuss the differences in paint.
- b. Mix paint properly.

LESSON 2. Preparing new and old surfaces, primers and application of paints -- 1 hour
- a. Surface preparation and use of primers.
- b. Apply paint properly.

LESSON 3. Selection, care and storage of paints and brushes -- 1 hour
- a. Design a storage area for painting materials.
- b. List the different paint bases available for purchase and any extra precautions needed for storage.

LESSON 4. Cutting glass and glazing windows -- 1 hour
- a. Discuss the procedure of glazing.
- b. Cut glass to fit size of window.
- c. Install a glass pane.

Unit XIII - Electrical Compentencies

1. Outlining electrical safety rules.
2. Defining electrical terms.
3. Applying the National Electric Code to basic wiring requirements.
4. The use of electrical tools and test equipment.
5. Sketch electrical circuits.

Unit XIII ELECTRIC PRINCIPLES (10 hours) -- Ability to . . .

LESSON 1. Becoming acquainted with electricity -- 3 hours
- a. Recognize how electricity is generated.
- b. Determine electrical applications on the farm.
- c. Calculate the cost of electricity.

LESSON 2. National Electric Code and safety -- 1 hour
- a. Discuss how to ground electrical systems.
- b. Recognize the importance of using only equipment approved by Underwriters Laboratories.
- c. Discuss the purpose and farm application of the National Electric Code.

LESSON 3. Electrical terms - 3 hours
- a. Define the electrical units volts, amperes, watts, kilowatt hour, and ohm.
- b. A.C. and D.C. current.
- c. Define single and three-phase current.
- d. Differentiate between series and parallel circuits.
- e. Measure electrical volts, amperes, ohms and watts.
- f. Trace an electrical circuit.

LESSON 4. Electrical terms -- 1 hour
- a. Perform demonstrations on volts, amps and watts on the electrical board.
- b. Calculate problems on figuring watts when given amps and volts, and calculating amps when given watts and volts.

LESSON 5. Electrical safety devices and trouble shooting -- 1 hour
- a. Recognize the operation of fuses and circuit breakers.
- b. List the hazards of overfusing and tampering with safety devices.
- c. List the types of fuses, fusetrons, fusestats and circuit breaker devices.
- d. Determine the effect of voltage drop in the farm wiring system.

LESSON 6. Electrical trouble shooting -- 1 hour
- a. List the steps to follow in trouble shooting an electrical circuit.
- b. Discuss reasons for following the order used in trouble shooting an electrical circuit.

Unit XIV - Electrical Wiring
1. Sketching circuits.
2. Wiring circuits.
3. Selection of the correct materials for a circuit.

Unit XIV ELECTRICAL WIRING (10 hours) -- Ability to . . .

LESSON 1. Elementary wiring and circuit maintenance -- 1 hour
- a. Make the underwriter's knot and attach a cap to a conductor.
- b. Discuss the basic types of service cords.
- c. Discuss the types of connectors (solder - solderless).

LESSON 2. Simple circuit -- 2 hours
- a. Wire a simple circuit including power source, fuse, switch, load and conductors (hot, neutral, and ground).
- b. Explain the function of each to the circuit.

LESSON 3. Repair of electrical wiring -- 2 hours
- a. To replace an old service cord on a piece of equipment.
- b. Make an extension cord.

LESSON 4. Wiring a 240 circuit -- 2 hours
- a. Discuss the difference between a 240 circuit and 120 circuit.
- b. Wire a 240 circuit.

LESSON 5. Wire size and type in relationship to length of circuit -- 1 hour
- a. List sizes of wire available.
- b. List recommended sizes of wire for different lengths of circuits.
- c. List different types of wire and where they are used.

LESSON 6. Wiring receptacles -- 2 hours
- a. Wire a 120 volt duplex receptacles.
- b. Wire a 240 volt duplex receptacles.
- c. Wire circuits involving sensing devices.
- d. Wire circuits involving motor controllers and push-button stations.

Unit XV - Tool Competencies

1. Identify and use all hand tool safely
2. Properly operate all power equipment safely
3. To recondition shop tools
4. Have an understanding of good quality tools
5. Order tools according to specifications.

Unit XV HAND TOOL IDENTIFICATION AND TOOL RECONDITIONING (15 hours) - Ability to..

LESSON 1. Identification of hand tools in shop -- 2 hours
- a. Quality comparison.
- b. Buying tools.
- c. Tool cleaning and storage.

LESSON 2. Principles and use of power tool operation -- 4 hours
- a. Read manufacturer's manuals to find out the kinds of operations machines can perform.
- b. Properly use each shop tool or machines.
- c. Recognize the proper lubrication and adjustments needed before using equipment safely and efficiently.

LESSON 3. Repair of equipment used in shop -- 2 hours
- a. Replace or repair minor parts or pieces on equipment under direction of instructor and the manufacturer's parts list and operators manuals.
- b. Read the manufacturer's manuals before removing parts.
- c. Recognize how to recondition old parts and order new parts.

LESSON 4. Hand tool reconditioning -- 3 hours
- a. Sharpen the hand tools in shop that need sharpening.
- b. Bring in hand tools that need sharpening.
- c. Properly use all hand tools in the shop.

LESSON 5. Proper tool use and safety -- 2 hours
- a. List what tools are used soil and water management.
- b. Identify the proper use of these tools.
- c. Use tools properly and safely.

LESSON 6. Safe use of power tools -- 2 hours
- a. Identify the proper use of the power tools.
- b. Use the power tools properly before being allowed to use them on his own.

Unit XVI - Cold Metal Competencies

1. The basic construction procedures involved in cold metal work.
2. To use the basic metal tools in constructing a project.
3. Properties of metals and how they apply to specific jobs.

Unit XVI COLD METAL (8 hours) -- Ability to . . .

LESSON 1. Marketing, bending, cutting, drilling, -punching and ordering metal - 4 hours
- a. Discuss the cutting characteristics of steel with varying carbon content.
- b. Discuss hacksaw blades: set of teeth, teeth/inch, tempering & type of metal.
- c. List file types and cuts.
- d. List twist drill sizes: Fractional, number and letter.
- e. Discuss types of punches and chisels.
- f. Use a hacksaw.
- g. Use a file.
- h. Discuss selection and use of twist drills.
- i. Cut metal cold chisel and use punches.
- j. Make metal with a center punch.
- k. Use a hand electric 1/4 ' or 3/8' drill.
- l. Use the drill press.
- m. Ordering method for steel.

LESSON 2. Bending and twisting cold metal -- 1 hour
- a. Discuss metal characteristics: toughness, ductility, brittleness, tensile strength.
- b. Discuss how to bend, twist, and roll metal.
- c. Bend cold metal in a vise or jig.
- d. Use the cold metal bending; Hossfeld or Diacro.
- e. Discuss structural shapes of metals.
- f. Use grinding wheel.

LESSON 3. How to cut threads and tap holes -- 1 hour
- a. List thread types.
- b. Discuss tap and die sizes.
- c. List threading and tapping lubricants.
- d. Setting the threading die.
- e. List causes of broken threads.
- f. Use tap and die set (screw plate).
- g. Adjust round split dies to proper size.
- h. Tap thread in a hole.
- i. Thread rod.
- j. Use an e-z-out.
- k. Clean taps and dies.
- l. Determine how to calculate pilot hole size for tapping.

LESSON 4. Eye bolt and hitch pin is to be formed during a five day period along with above subject matter -- 2 hours
- a. Make an eye at the end of a piece of metal.
- b. Assemble projects to dimension.
- c. Weld component parts.
- d. Dress finished project; paint, plish.

Unit XVII - Sheet Metal Compentencies

1. The proper layout of sheet metal projects.
2. The proper use of sheet metal tools and equipment.
3. Selection of the correct sheet metal for the job.

Unit XVII SHEET METAL (5 hours) -- Ability to . . .

LESSON 1. Working with sheet metal -- 1 hour
- a. Discuss the gage sized of sheet metal.
- b. Discuss the galvanization treatment of sheet metal.
- c. Recognize how sheet metal is made and surface treated.
- d. Recognize;select the proper gage size of sheet metal for a job.

LESSON 2. Sheet metal measuring and layout tools -- 1 hour
- a. Use the calipers and dividers in laying out sheet metal.
- b. Determine sheet metal thickness using the micrometer and gage.

LESSON 3. Sheet metal - working hand tools -- 1 hour
- a. Select and properly use a hacksaw and chisel in forming sheet metal.
- b. Use tinner's snips to cut straight and curved lines in sheet metal manipulation.
- c. Use the file and filing procedures which are appropriate for sheet metal work.
- d. Use the nibbler or electric shear.

LESSON 4. Sheet metal working machines -- 1 hour
- a. Use the squaring shears and circle shears.
- b. Use the folding and behind machines.
- c. List the various types of edges and folds and how they may be used for application on the projects.

LESSON 5. Sheet metal layout and pattern design -- 1 hour
- a. Recognize how patterns or templates are used.
- b. Recognize how patterns are transferred.
- c. Layout sheet metal patterns for a given sheet metal objective from the given dimensions of the object.

Unit XVIII - Soldering Competencies

1. The proper selection and use of various fluxes and solders.
2. The proper selection and use of equipment.
3. Soldering various materials.

Unit XVIII SOLDERING (5 hours) -- Ability to . . .

LESSON 1. The principles of soldering -- 2 hours
- a. Outline how soldering holds metal together.
- b. Select the proper solder for the metal.
- c. Select the proper flux for the metal.
- d. Mechanically clean the metal.
- e. Chemically clean the metal.
- f. Tin the soldering iron or the metal being joined.

LESSON 2. Soldering Copper Tubing -- 1 hour
- a. Solder rigid copper fitting to the tubing.

LESSON 3. Soldering galvanized metal -- 1 hour
- a. Repairing galvanized metal projects.
- b. Making and soldering galvanized metal projects.

LESSON 4. Soldering copper wire -- 1/2 hour
- a. Repairing copper wire projects.
- b. Making and soldering projects with copper wire.

LESSON 5. Soldering other metals -- 1/2 hour
- a. Repairing black iron projects.
- b. Repairing tin projects.

Unit XIX - Plumbing Competencies

1. Selection of materials used in plumbing
2. How to measure, cut and thread pipe.
3. Selection and use of plumbing tools.
4. Selection and use of plastic pipe, copper and braces.

Unit XIX PLUMBING (8 hours) -- Ability to . . .

LESSON 1. The materials used in plumbing; galvanized, plastic and copper --1 hour
- a. List possible plumbing materials.
- b. List tools used in plumbing.
- c. Handle the many tools, list their names.
- d. Discuss plumbing terms.

LESSON 2. The cutting and threading of pipe -- 2 hours
- a. Discuss the cutting of pipe.
- b. Cut pipe in the shop.
- c. Cut threads on pipe.
- d. Cut on different types of pipe.

UNIT XIX - continued

LESSON 3. Plastic pipe -- 1 hour
a. Select proper type for the job.
b. Assemble a plastic pipe project.

LESSON 4. Flexible copper -- 1 hour
a. Selection of proper fittings for the job.
b. Cutting and flaring of the tubing.
c. Determine the length needed.
d. Assemble a project to specifications.

LESSON 5. The different fittings; galvanized, plastic and copper -- 2 hours
a. List the many types of fittings.
b. Use some of the fittings in the shop.

UNIT XX - Safety

1. Recognition and practice of all safety rules.

UNIT XX SAFETY (10 hours) -- Ability to . . .

LESSON 1. General shop safety - time depends on shop conditions
a. Horseplay.
b. Cleanup.
c. Tool safety.
d. Safety glasses.
e. Work habits.

LESSON 2. Power tool safety -- time depends on tools available.

LESSON 3. Safety films -- time depends on need.

UNIT XXI - Project Construction

1. Plan and construct projects

UNIT XXI PROJECT CONSTRUCTION (30-50 hours)